OPERATING MANUAL

CCITT G.703 64 kb/s
DATA INTERFACE
(MODEL 30608)
OPERATING MANUAL

FIREBERD™

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GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information on Telecommunications Techniques Corporation's (TTC) CCITT G.703 64 kb/s Data Interface (Model 30608). This information is divided into sections on: general information; interface description, installation, and set-up; mainframe set-up; interface specifications; and service information.

1.2 OVERVIEW

The CCITT G.703 64 kb/s Data Interface allows a FIREBERD mainframe to test communications equipment and systems that conform with CCITT Recommendation G.703.

1.3 INTERFACE FEATURES

The CCITT G.703 64 kb/s Data Interface has the following features.

- Allows testing of communications systems operating in Codirectional, Centralized Clock, and Contradirectional Interface modes.
- Generates and detects the 8 kHz octet timing signal.
- Generates timing with the 64 kHz oscillator installed in the interface or from the FIREBERD mainframe.
- Transmits data either with or without an octet timing signal and receives data with or without octet timing.
- Conducts jitter analysis, generates and inserts programmable jitter using the FIREBERD 6000 with Options 6007 and 6008.
- Inserts logic errors into a live data stream in the Thru Data mode.
- Echoes all received data to the transmit output. Jitter or logic errors can be inserted into the retransmitted data. Link simulation can be performed by inserting logic errors into the transmitted data.
- Performs wideband jitter measurement and jitter spectral analysis using the FIREBERD 6000 with options 6007 and 6008.
- Can transmit data with or without octet timing signal.
- Detects Alarm Indication Signal (AIS) conditions.

1.4 INTERFACE COMPATIBILITY

The CCITT G.703 64 kb/s Data Interface meets CCITT Recommendation G.703 64 kb/s for codirectional, centralized clock, and contradirectional timing interfaces.

1.5 OPTIONS AND ACCESSORIES

The following cables are available from TTC for the CCITT G.703 64 kb/s Data Interface.

- Model 30687, 10' cable with 3-pin banana plug to 3-pin banana plug.
- Model 30761, 10' cable with 3-pin banana plug to bantam plug.

In addition to these cables, BNC connectors may also be used but are not provided by TTC.

INTERFACE DESCRIPTION

2.1 INTRODUCTION

The CCITT G.703 64 kb/s Data Interface is a menu-controlled interface. This section describes the interface physical dimensions, switch controls, functional operation, timing sources, and the self-loop test.

2.2 PHYSICAL DESCRIPTION

The CCITT G.703 64 kb/s Data Interface measures 7.3 inches (185 mm) wide, 1.5 inches (38 mm) high, and 5.1 inches (130 mm) deep. Two spring-tensioned screws secure the interface module to the FIREBERD Communications Analyzer rear panel. Connector pins on the interface module mate with the mainframe's connector receptacle when the interface panel is flush with the mainframe rear panel. Turning the two screws on the interface panel, until snug, secures the module into the analyzer mainframe.

Figure 2-1 illustrates the CCITT G.703 64 kb/s Data Interface panel. Female banana receptacles are used to provide both the input and output connections for the signal and clock connectors.

Four toggle switches provide the interface hardware controls. The following paragraphs describe these interface controls. When this interface is installed in the FIREBERD 6000 or FIREBERD 4000, all of these control switches are under software control and can be set and reset by the front panel controls.

EMULATE Switch - This two-position toggle switch selects either the DTE or DCE device. In the up position, a DTE device is emulated and in the down position, a DCE device is emulated. **NOTE:** When the mode switch is set to the CODIR position, the EMULATE switch is ignored, since both DTE and DCE are identical in function.

Mode Switch - This two-position toggle switch selects between the three interface functions. With this switch set to the CODIR position, the Codirectional mode is selected. In this position, the EMULATE switch position is ignored, since both DTE and DCE are identical in function. With this switch set to the CENTRA/CONTRA position, the Centralized Clock or Contradirectional mode is selected. In the Centralized Clock mode, the EMULATE toggle switch must be set to the DTE position and the TIMING switch must be set to the RECOV position. In the Contradirectional mode, the EMULATE toggle switch controls the interface emulation. The interface may either emulate a DTE device (with the EMULATE switch in the DTE position) or emulate a DCE device (with the EMULATE switch in the DCE position).

Impedance Switch - This two-position toggle switch controls the interface input impedance. When this switch is set to the TERM position, the interface input impedance is 120-ohms. With this toggle switch set to the BRIDGE position, the interface input impedance is 1000 ohms.

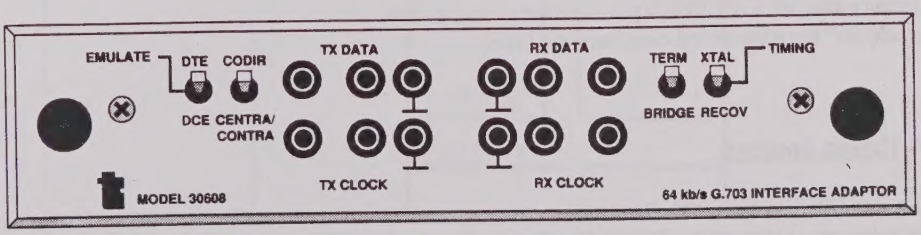

Figure 2-1
CCITT G.703 64 kb/s Data Interface

Timing Switch - This two-position toggle switch selects the transmit timing source. In the XTAL position, the crystal oscillator, located in the CCITT G.703 64 kb/s Data Interface, is the transmit timing source. With this toggle switch set to the RECOV position, the timing clock is recovered from the incoming G.703 data in the Codirectional mode. In Centralized Clock and Contradirectional DTE modes, the input clock signal from the TX CLOCK connector is the transmit timing source.

2.3 FUNCTIONAL DESCRIPTION

The CCITT G.703 64 kb/s Data Interface allows a FIREBERD Communications Analyzer to test communications systems which conform to the 64 kb/s digital channel service. This interface operates in one of three interface modes - Codirectional, Centralized Clock, or Contradirectional. In each interface mode, the 8 kHz octet timing signal may be realized by introducing bipolar violations for every eighth bit in the timing signal. The violation block marks the last bit in an octet.

In the Codirectional mode, the data and associated timing signals are transmitted in the same direction. The timing signal is imbedded in the data stream. Figure 2-2 illustrates the data and signal flow associated with the Codirectional operating mode.

In the Centralized Clock mode, the timing signals associated with the data signals for both directions of transmission are supplied from a centralized clock source. Figure 2-3 illustrates the data and signal flow associated with the Centralized Clock mode of operation.

In the Contradirectional mode, the timing signals associated with both directions of transmission are directed toward the DTE side of the interface. Figure 2-4 illustrates the data and signal flow during the Contradirectional mode of operation. With the Contradirectional mode selected, two modes of emulation are available: DTE (office terminal service side) emulation and DCE (office terminal line side) emulation. In the DTE emulation mode, the transmit clock associated with the transmit data is provided from the DCE. In the DCE emulation mode, the FIREBERD provides the transmit clock to "clock out" the transmitted data from the DTE.

2.3.1 Timing Sources

On the FIREBERD 6000, five transmit timing sources can be selected: (1) the clock recovered by the interface from the incoming G.703 64 kb/s codirectional signal; (2) the synthesizer clock, which can provide an internal timing reference at or around 64 kHz; (3) the external BNC input; (4) the AMI-composite clock signal, supplied from the DCE (in Contradirectional mode); or (5) a centralized AMI-composite clock signal (in Centralized Clock mode). Selection of the timing source in the FIREBERD 6000 is made by pressing the front panel pushbutton switch labeled GEN CLK. Repeatedly pressing this pushbutton switch scrolls the selected timing source through its three selections (SYNTH, INTF, or BNC).

Selection of the timing source on the FIREBERD 4000 is made by pressing the SETUP CATEGORY rocker switch until the LED next to the GENERATOR CLOCK label is illuminated. The three softkey pushbutton switches above the SETUP panel are used to select the INTRNL, INTF, or BNC as the transmit timing source.

2.3.2 Self-Loop

This interface includes a relay that is activated by the SELF LOOP pushbutton switch on the FIREBERD front panel. Pressing the SELF LOOP pushbutton switch connects the TX DATA line drivers to the RX DATA line drivers. This provides quick verification of the FIREBERD and the data interface when performing bit error detection. The input and primary output connections do not need to be removed during the test, since complete isolation is provided by the relay.

NOTE: Do not set the generator clock (GEN CLK on the FIREBERD 6000 or GENERATOR CLOCK on the FIREBERD 4000) to the INTF position during the Self-Loop mode. Also be sure the interface THRU menu is set to OFF.

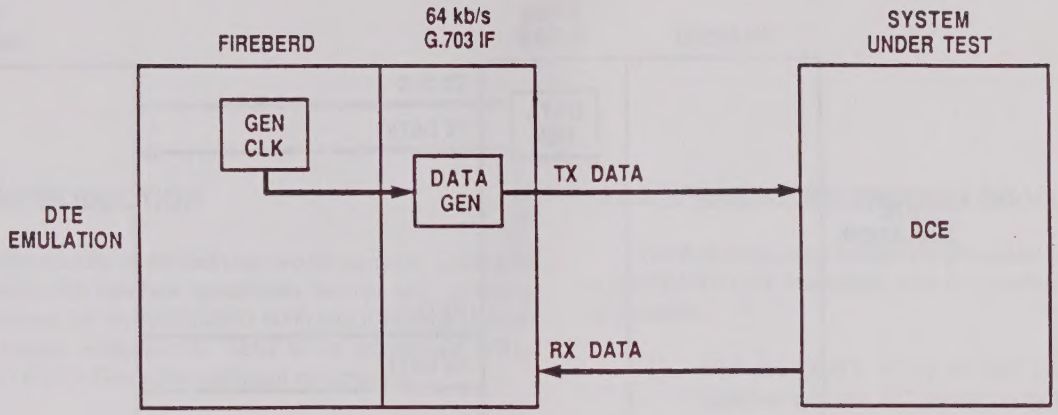

Figure 2-2
Codirectional Operating Mode

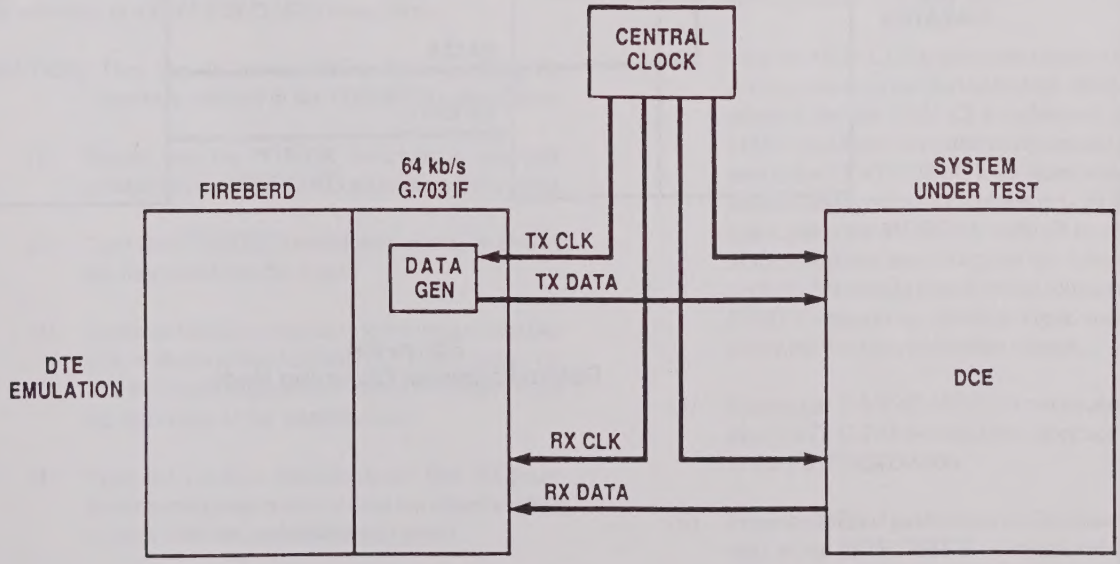

Figure 2-3
Centralized Clock Operating Mode

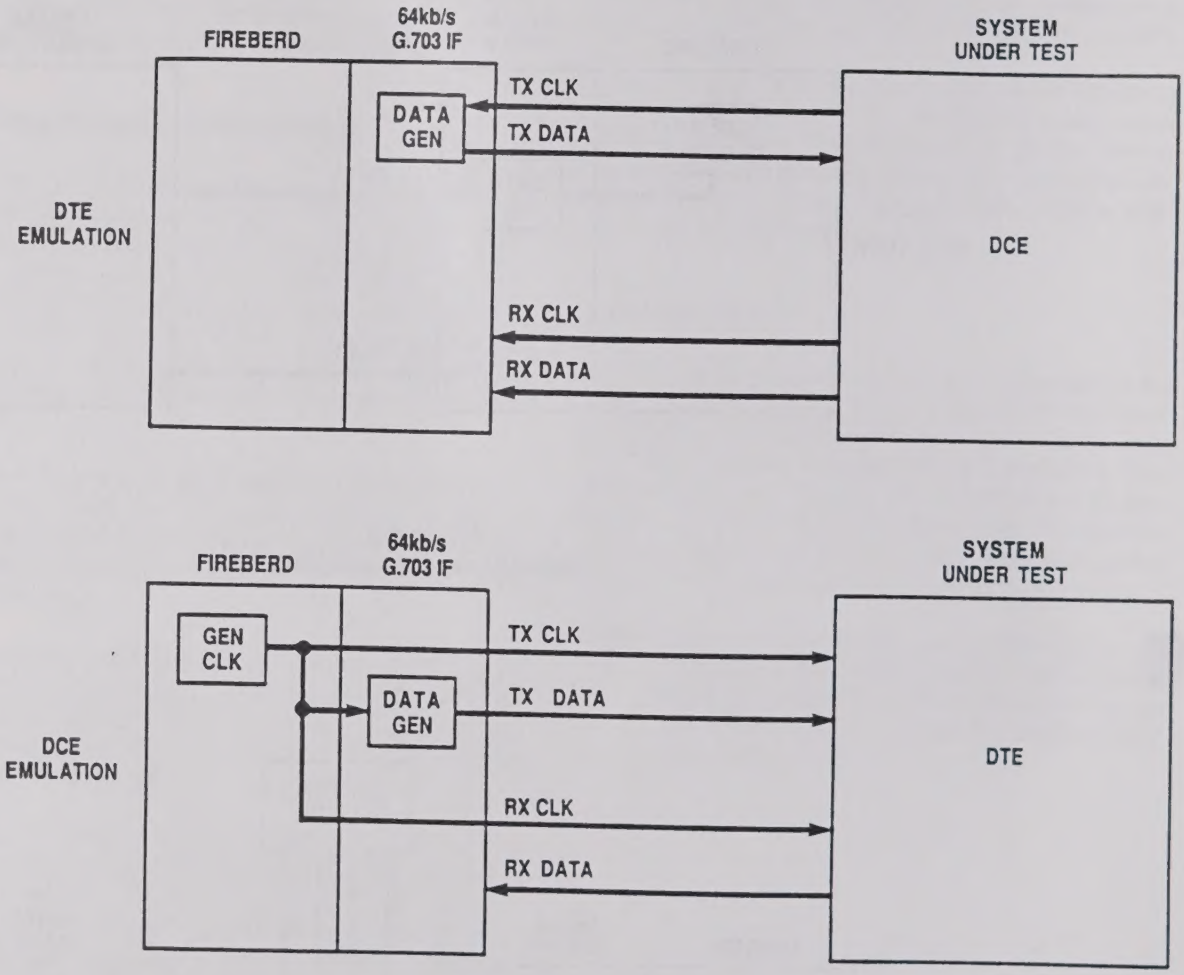

Figure 2-4
Contradirectional Operating Mode

INTERFACE INSTALLATION, SETUP, AND OPERATION

3.1 INTRODUCTION

This section is divided into two major parts. Each part describes the interface installation, set-up, and operating procedures for the FIREBERD 6000 and FIREBERD 4000 mainframes, respectively. Refer to the appropriate FIREBERD User's Guide for additional information.

3.2 FIREBERD 6000

The following sections describe installation, set-up, and operation of this interface for the FIREBERD 6000 mainframe.

3.2.1 Interface Installation

The following procedure describes the steps for installing the interface in a FIREBERD 6000 mainframe.

CAUTION: Turn the AC power OFF before installing the interface module in the FIREBERD mainframe.

(1) Ensure that the POWER switch is in the OFF position on the FIREBERD mainframe front panel.

(2) Turn the FIREBERD mainframe around to expose the rear panel interface slot.

(3) Insert the interface module into the vacant interface slot, with the printed circuit (PC) board facing up. The PC board edges fit into slides on either side at the top edges of the interface slot.

(4) Press the interface module firmly into the mainframe mating connector, until the interface faceplate is flush with the mainframe rear panel.

(5) Secure the interface in the mainframe by turning the two screws on the interface front panel clockwise, until finger tight.

3.2.2 FIREBERD 6000 Mainframe Set-Up

The following steps outline the procedure for setting up a FIREBERD 6000 mainframe after the interface installation is complete.

(1) With the CCITT G.703 64 kb/s Data Interface installed, turn the AC power on by pressing the front panel POWER switch to the ON position.

(2) Connect the G.703 signal source to the desired interface panel RECEIVER connector. Refer to Figure 3-1 for the signal connectors.

(3) Press the DATA pushbutton switch to select the desired data pattern. A data pattern is selected when the LED is illuminated next to the data pattern label. Refer to the FIREBERD 6000 User's Guide for a description of the different data patterns available and their uses.

(4) Press the GEN CLK pushbutton to select the signal timing source for use during the test. With SYNTH selected for the GEN CLK reference, press the MENU pushbutton switch to illuminate the LED next to the SYNTH FREQ front panel label. Verify the selected synthesizer frequency is 64 kHz. If it is not, press the MORE key until 64 is seen as one of the selections and then press the corresponding softkey. Selecting a signal timing source other than SYNTH requires an external clock source from either the network or another source.

(5) Setting the TIMING MODE is not necessary with the CCITT G.703 64 kb/s Data Interface installed in the FIREBERD 6000.

(6) Press the MENU pushbutton to illuminate the LED next to the INTF SETUP (interface set-up) label. The message: **INTERFACE: XXXXXX** is displayed on the top line and the available interfaces are displayed on the bottom line.

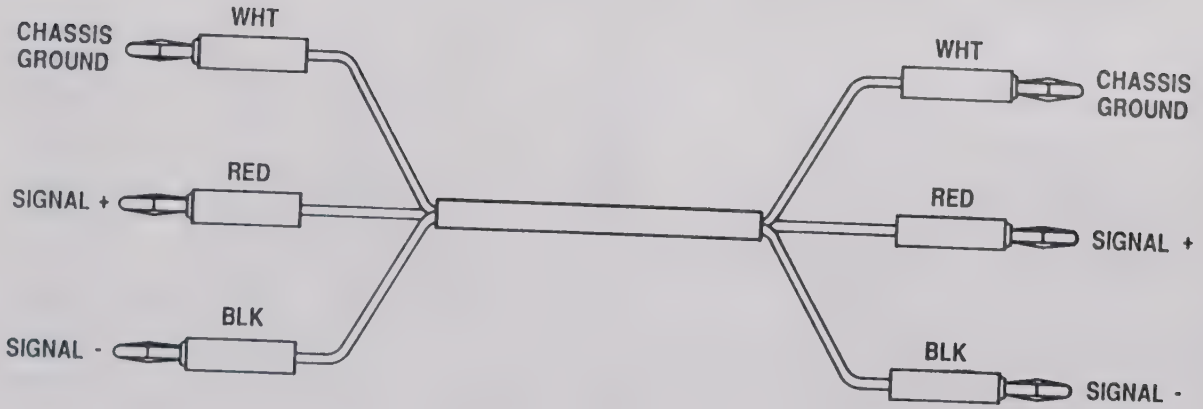

Figure 3-1
Signal Connectors

(7) Press the 64G703 softkey to select the CCITT G.703 64 kb/s Data Interface. Pressing this softkey displays: **INTERFACE: 64G703** on the top line and the first three menu selections (**MODE, THRU,** and **ERRINS**) on the bottom line.

(8) Once the desired menu parameter is visible in the display, press the corresponding softkey to change the interface operating parameter. Refer to Section 3.2.3 for a description of the interface menus and their selections.

(9) After the interface parameters are set as desired, press the ENTER key to display the top level (home) interface menu (**INTERFACE: 64G703**) or press the up arrow key and then the MORE key to scroll through the other interface parameters.

(10) Press the MENU pushbutton to select other criteria required for the test to be performed.

(11) Set the other front panel controls (ANALYSIS RESULTS, ANALYSIS MODE, PRINTER, etc.) as required for the test to be performed.

(12) Press the SELF LOOP pushbutton switch to perform the self-test on the mainframe and installed interface.

3.2.3 Interface Set-Up

This section describes the interface selections available for the FIREBERD 6000, after the mainframe has been configured. The CCITT G.703 64 kb/s Data Interface may either be controlled through the FIREBERD 6000 front panel controls or by the interface panel controls. Observe the display above the softkeys to see the **64G703** interface listed. Press the softkey directly below the displayed 64G703 listing. This displays the first three interface menus (MODE, THRU, and ERRINS) and illuminates the LED within the MORE key. Pressing the MORE key displays the next two menu selections (INPUT and OCTET) and the MORE key is still illuminated. Pressing the MORE key again redisplays the first three menu items. Use the MORE key to display the menu selection that you desire to verify or change and then press the corresponding softkey to enter that menu.

Once in the 64G703 interface menu, pressing the up arrow key displays the next higher menu level. Pressing the ENTER key displays the interface selection menu top (home) level. Figure 3-2 illustrates the CCITT G.703 64 kb/s Data Interface menu for the FIREBERD 6000.

The following paragraphs list each menu, along with a description of the selections available.

With the 64G703 interface selected, selecting the MODE menu allows selection of either CODIR (Codirectional), CENTRA (Centralized Clock), or CONTRA (Contradirectional) mode. Pressing the corresponding softkey selects the associated mode of operation. If the CONTRA softkey is pressed, another menu (EMULATE) is displayed. The EMULATE menu allows selection of either DTE or DCE emulation.

MODE

CODIR - Selects the Codirectional operating mode.

CENTRA - Selects the Centralized Clock operating mode.

CONTRA - Selects the Contradirectional operating mode. With this softkey pressed, another menu (EMULATE) is displayed. Two menu selections DTE and DCE are on this menu display. Pressing the DTE softkey causes the interface to emulate a DTE device. Pressing the DCE softkey causes the interface to emulate a DCE device.

THRU

OFF - Disables the Thru Data mode.

ON - Selects the Thru Data mode.

NOTE: With the Thru Data mode set to ON,the RX DATA and RX CLOCK are fed to an elastic buffer and then retransmitted to the TX DATA and TX CLOCK outputs. In the Thru Data mode, jitter and either single or variable rate logic errors can be inserted into the data stream.

NOTE: The Thru Data mode is only available when the interface is under FIREBERD control.

NOTE: While in the Thru Data mode, the octet timing associated with the retransmitted data is exactly the same as the timing received (i.e., the phase relationship between BPVs and data is maintained). Thus, the octet timing switch is disabled in the Thru Data mode.

ERRINS

OFF - Does not insert any errors into the transmitted data.

SINGLE - Inserts single errors into the transmitted data after framing and line encoding have been performed.

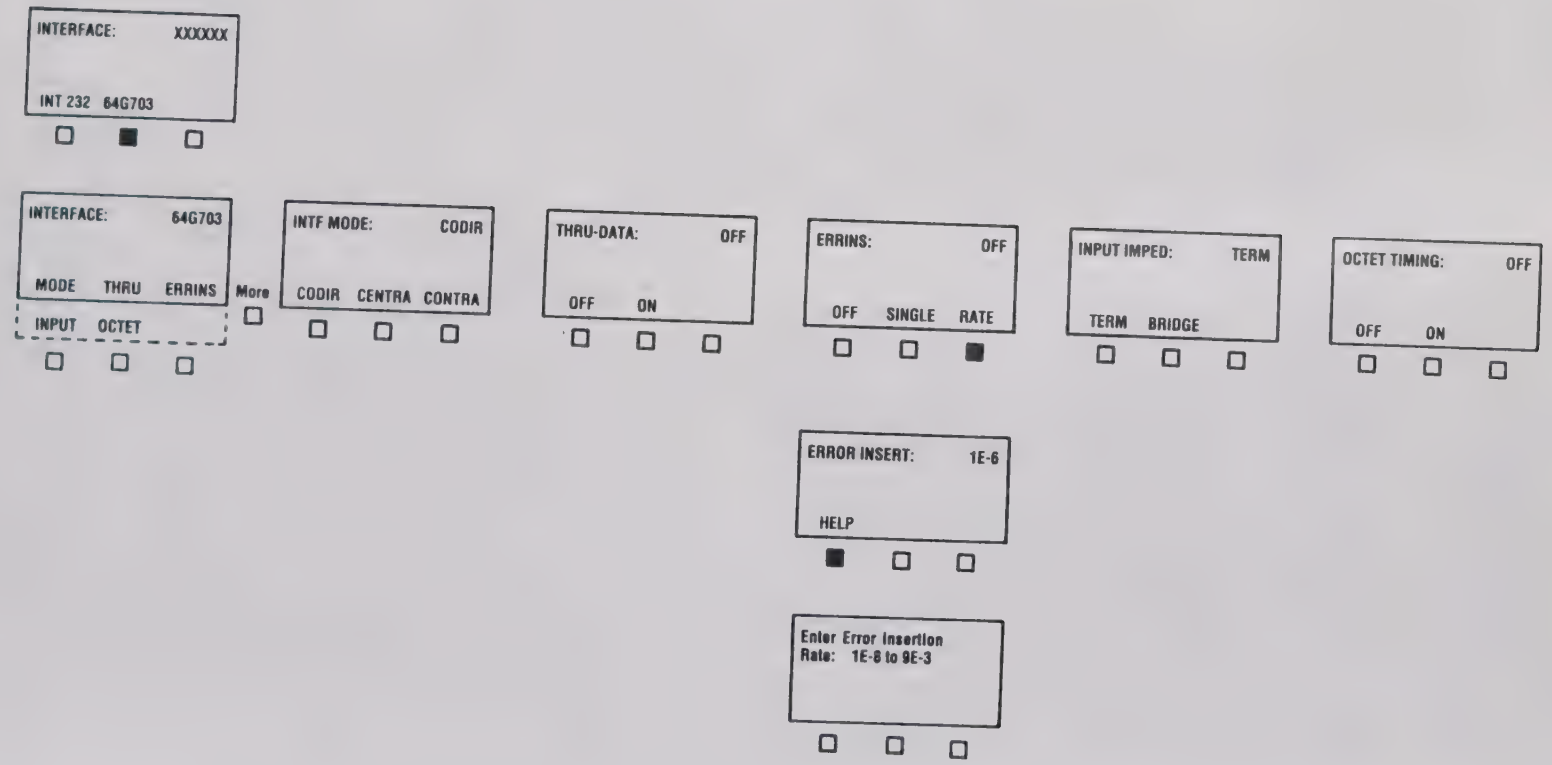

Figure 3-2
FIREBERD 6000 CCITT G.703 64 kb/s Data Interface Menu

No code (BPV) errors are generated. Inserted errors cause logic errors and may cause frame word errors. After the error burst has been transmitted, the error insert menu displays: OFF.

NOTE: To generate accurate error insertion rates, the FIREBERD frequency synthesizer must be set to 64 kHz, even if the synthesizer is not used as the source of transmit timing.

RATE - Inserts errors on the transmit signal at selectable error rates after framing and line encoding have been performed. Inserted errors cause logic errors and may cause frame word errors.

Selection of the error insertion rate is operator selectable for the FIREBERD 6000 and is controlled by pressing the RATE softkey. This positions the cursor under the mantissa (the first digit) and displays HELP at the bottom of the screen. Pressing the corresponding HELP softkey displays the message **Enter error insertion rate. Rates: 1E-8 to 9E-3** and places the cursor under the mantissa. Using the keypad keys (1-9), a new value may be entered. Pressing the desired value moves the cursor under the exponent and **ERROR INSERT:** is visible in the display. Pressing the ENTER key at this time moves the cursor back to the mantissa, if the entered value was not correct or needs to be changed. Use the keypad keys (3 - 8) to select the new rate desired. Entering an out of tolerance value and then pressing the ENTER key produces an audio tone and redisplays the last valid insertion rate. The new rate is not selected until the ENTER key is pressed. Until the ENTER key is pressed, the BPV is transmitted at the previously displayed rate. Pressing the ENTER key changes the BPV rate to the new rate and redisplays the top level menu for the interface selection.

INPUT

TERM - Terminates the monitored line with 120 ohms. This function is selected when the FIREBERD is used to terminate a span line.

BRIDGE - Provides a minimum of 1000 ohms input impedance. This function is selected when the FIREBERD is monitoring a span line to prevent unnecessary loading of the signal being monitored.

OCTET

OFF - Disables the octet timing.

ON - Enables the octet timing. **NOTE:** Octet timing is only available when the CCITT G.703 64 kb/s Data Interface is under FIREBERD control

3.2.4 FIREBERD 6000 Interface Remote Control

Using the built-in RS-232 interface or the optional IEEE-488 interface, the FIREBERD 6000 mainframe can be remotely controlled. The Remote Control Commands Handbook describes the mainframe remote control capabilities.

Only the remote control commands specific to this interface are included in Table 3-1. Also note that these commands are used with a FIREBERD 6000 with at least Revision G software. Remote control commands that support Revision F software or lower are contained in Appendix A of this manual.

If the CCITT G.703 64 kb/s interface is installed in the FIREBERD 6000's rear panel, issue the following command prior to using the commands listed in Table 3-1:

>INTF:SELECT EXT

If the CCITT G.703 64 kb/s interface is installed in an ISU-6000, specify the ISU and slot numbers as follows:

>INTF:SELECT:ISU 1,3

EXAMPLE: The CCITT G.703 64 kb/s interface is in ISU #1, Slot #3.

3.3 FIREBERD 4000

The following sections describe the installation, set-up, and operation of this interface into a FIREBERD 4000 mainframe.

3.3.1 Interface Installation

CAUTION: Turn the AC power OFF before installing the interface module in the FIREBERD mainframe.

(1) Ensure the POWER switch, located on the rear panel, is in the OFF position on the FIREBERD mainframe.

(2) Turn the FIREBERD mainframe around to expose the rear panel interface slot(s). The FIREBERD 4000 may have two interface slots, if Option 4001 (optional interface) is installed. Slot 1 (the bottom slot) is standard and Slot 2 (the top slot) is optional.

(3) Insert the interface module into the vacant interface slot, with the printed circuit (PC) board facing up. The PC board edges fit into slides on either side at the top edges of the interface slot.

Table 3-1
FIREBERD 6000 G.703 64 kb/s Data Interface Remote Commands

Remote Command	Result
INTF:64KG703:MODE?	Displays the interface mode.
INTF:64KG703:MODE CODIR	Selects the Codirectional mode.
INTF:64KG703:MODE CENTRA	Selects the Centralized Clock mode.
INTF:64KG703:MODE CONTRA	Selects the Contradirectional mode.
INTF:64KG703:MODE:CONTRA?	Displays the Contradirectional emulation mode.
INTF:64KG703:MODE:CONTRA DTE	Selects the DTE emulation mode.
INTF:64KG703:MODE:CONTRA DCE	Selects the DCE emulation mode.
INTF:64KG703:OCTET_TIMING?	Displays the status of octet timing.
INTF:64KG703:OCTET_TIMING OFF	Disables octet timing.
INTF:64KG703:OCTET_TIMING ON	Enables octet timing.
INTF:64KG703:INPUT?	Displays the interface input impedance.
INTF:64KG703:INPUT TERM	Selects the 120-ohm interface input impedance.
INTF:64KG703:INPUT BRIDGE	Selects the 1000-ohm interface input impedance.
INTF:64KG703:THRU_MODE?	Displays the status of the thru-loopback mode.
INTF:64KG703:THRU_MODE OFF	Disables the thru-loopback mode.
INTF:64KG703:THRU_MODE ON	Enables the thru-loopback mode.
INTF:64KG703:ERR_INSERT?	Displays the error insertion mode.
INTF:64KG703:ERR_INSERT OFF	Disables error insertion mode.
INTF:64KG703:ERR_INSERT SINGLE	Selects the single error insertion mode.
INTF:64KG703:ERR_INSERT RATE	Selects the operator-specified error insertion mode.
INTF:64KG703:ERR_RATE?	Displays the operator-specified error insertion rate.
INTF:64KG703:ERR_RATE (rate string)	Selects the operator-specified error insertion rate (xE-y, where x = 1 to 9 and y = 3 to 9).

(4) Press the interface module firmly into the mainframe mating connector, until the interface faceplate is flush with the mainframe rear panel.

(5) Secure the interface in the mainframe by turning the two screws on the interface front panel clockwise, until finger tight.

3.3.2 FIREBERD 4000 Mainframe Set-Up

The following steps outline the procedure for setting up a FIREBERD 4000 mainframe.

(1) With the CCITT G.703 64 kb/s Data Interface installed, turn the AC power ON by pressing the rear panel POWER switch to the ON position.

(2) Connect the G.703 signal source to the desired interface panel RECEIVER connector.

(3) Press the SETUP CATEGORY rocker sw
illuminate the LED next to PATTERN on th
panel. The first three available data patte
displayed on the bottom line of the displa
LED within the MORE key illuminates, ind
the availability of additional patterns. The se
data pattern is visible after **PATTERN:** in t
play. Refer to the FIREBERD 4000 User's
for a description of the different data p
available and their uses.

(4) Press the SETUP CATEGORY rocker sw
illuminate the LED next to the GENER
CLOCK label to select the timing source f
during the test.

NOTE: Selecting BNC requires an external cloc
either the network or from another sourc

(5) The front panel displays **GEN CLOCK: INTF**
the top line and displays the menu choices
bottom line. Press the right SETUP SE

rocker switch to display additional internal frequencies. Verify 64.0 is displayed for the internal frequency; if not, press the MORE key to display 64.0 and press the corresponding softkey. Selecting the BNC signal signal timing source requires an external clock source from either the network or another source.

(6) Press the SETUP CATEGORY rocker switch to illuminate the LED next to the INTERFACE label. The message **INTERFACE: XXXXXX** is displayed on the top line and a list of available interfaces is displayed on the bottom line.

(7) Press the 64G703 softkey to select the CCITT G.703 64 kb/s Data Interface. Pressing this softkey displays: **INTERFACE: 64G703** on the top line. Pressing the right SETUP SELECT rocker switch displays the first menu on the bottom line. Repeatedly pressing the right SETUP SELECT switch scrolls through the menus and back to the top level (home) interface menu. Refer to Figure 3-3 for the FIREBERD 4000 CCITT G.703 64 kb/s Data Interface menu.

(8) Once the desired menu parameter is visible in the display, press the corresponding softkey to change the interface operating parameter. Refer to Section 3.3.3 for a description of the interfce menus and their selections.

(9) After the interface parameter is set as desired, press the HOME key to display the top level (home) interface menu (**INTERFACE: 64G703**), or continue pressing the right SETUP SELECT rocker switch to continue through the other interface parameters.

(10) Press the SETUP CATEGORY rocker switch to set or verify other criteria required for the test that is to be performed. Pressing the SETUP CATEGORY rocker switch to illuminate the LED next to the SETUP SUMMARY label displays the selected test pattern, interface, clock frequency, and the two most significant interface parameters.

(11) Set the other front panel controls (RESULT SELECT, CATEGORY, PRINTER, etc.) as required to configure the mainframe for the test to be performed. The SETUP SUMMARY may be used to quickly view the mainframe setup parameters.

(12) Press the SELF LOOP pushbutton switch to perform the self-test on the mainframe and installed interface.

3.3.3 Interface Set-Up

This section describes the interface selections available for the FIREBERD 4000 after the mainframe has been configured. The G.703 Data Interface is selected and controlled by the FIREBERD 4000 front panel. With the 64G703 interface selected, pressing the SETUP SELECT rocker switch (either left or right) displays the different 64G703 menus. Repeatedly pressing the SETUP SELECT switch scrolls through the menu selections and then redisplays the interface top level menu. Pressing the HOME keypad key also redisplays the top level (home) interface menu.

Each of the 64G703 menus and selections are listed and described in the following paragraphs.

INTF MODE

CODIR - Selects the Codirectional operating mode.

CENTRA - Selects the Centralized Clock operating mode.

CONTRA - Selects the Contradirectional operating mode. With this softkey pressed, another menu EMULATE is displayed. Two menu selections DTE and DCE are on this menu display. Pressing the DTE softkey causes the interface to emulate a DTE device. Pressing the DCE softkey causes the interface to emulate a DCE devicea and does not display the Thru Data menu.

INPUT IMPED

TERM - Terminates the monitored line with 120-ohms. This function is selected when the FIREBERD is used to terminate a span line.

BRIDGE - Provides a minimum of 1000 ohms input impedance. This function is selected when the FIREBERD is monitoring a span line to prevent unnecessary loading of the signal being monitored.

THRU DATA

OFF - Disables the Thru Data mode.

ON - Selects the Thru Data mode.

NOTE: In the CONTRA mode, the DTE menu must also be selected. With Thru Data set to ON, the RX DATA and RX CLOCK are fed to an elastic buffer and then retransmitted to the TX DATA and TX CLOCK outputs. In the Thru Data mode,

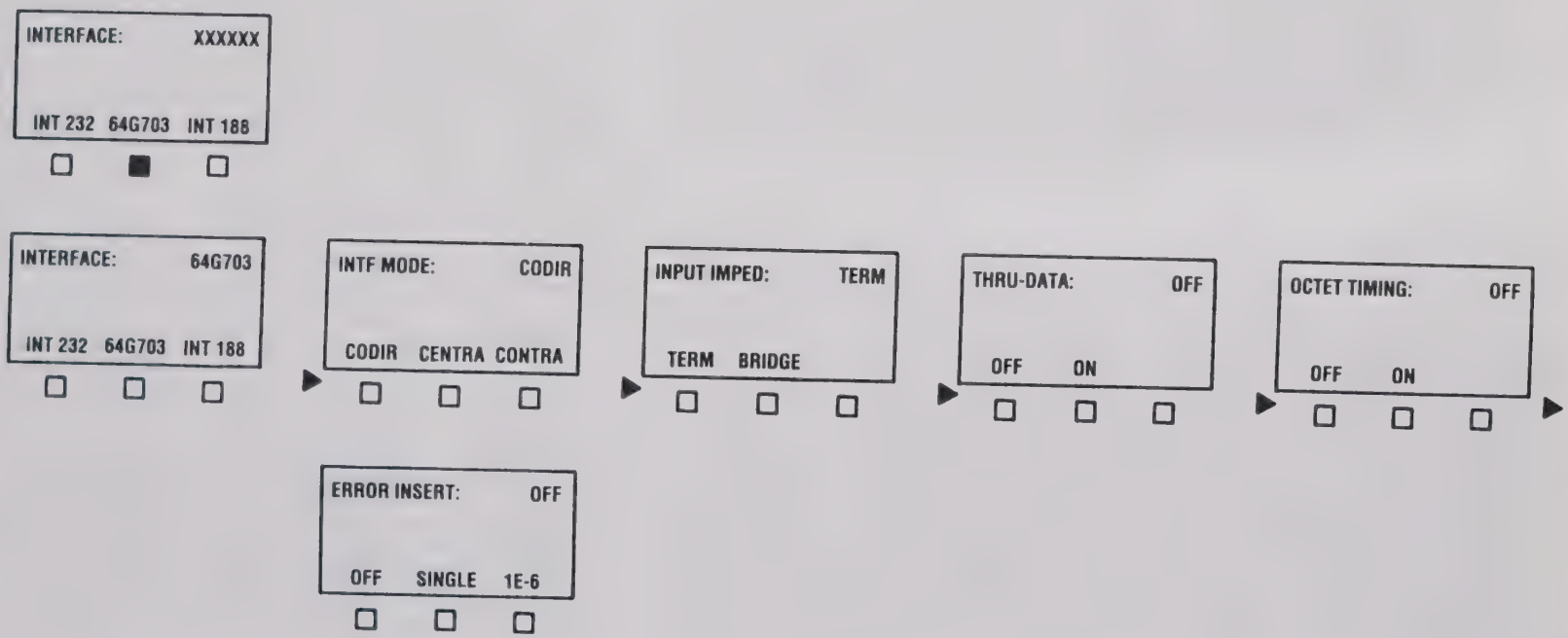

Figure 3-3
FIREBERD 4000 CCITT G.703 64 kb/s Data Interface Menu

either single or variable rate logic errors can be inserted into the data stream.

NOTE: The Thru Data mode is only available when the interface is under FIREBERD control.

NOTE: While in the Thru Data mode, the octet timing associated with the retransmitted data is exactly the same as the timing received (i.e., the phase relationship between BPVs and data is maintained). Thus, the octet timing switch is disabled in the Thru Data mode.

OCTET TIMING

OFF - Disables the octet timing.

ON - Enables the octet timing.

NOTE: Octet timing is only available when the CCITT G.703 64 kb/s Data Interface is under FIREBERD control

ERR INSERT

OFF - Does not insert any errors into the transmitted data.

SINGLE - Inserts a single bit error into the transmitted data after framing and line encoding have been performed. No code (BPV) errors are generated. Inserted errors cause logic errors and may cause frame word errors. After the error burst has been transmitted, the error insert menu displays: OFF.

1E-6 - Inserts errors on the transmitted signal at the rate of 1 bit in 1,000,000.

NOTE: To ensure accurate insertion rates, the synthesizer frequency must be set to 64 kHz. Any other setting causes inaccurate insertion rates.

3.3.4 FIREBERD 4000 Interface Remote Control

Using the built-in RS-232 interface or the optional IEEE-488 interface, the FIREBERD mainframe can be remotely

Table 3-2
FIREBERD 4000 CCITT G.703 64 kb/s Data Interface Remote Commands

Remote Command	Result
INT SET	Displays the active interface
INT SEL SLOT 1	Selects the interface in slot 1
INT SEL SLOT 2	Selects the interface in slot 2
INT SET 64G703 MOD COD	Selects the Codirectional mode
INT SET 64G703 MOD CEN	Selects the Centralized Clock mode
INT SET 64G703 MOD CON DTE	Selects the Contradirectional mode with DTE emulation
INT SET 64G703 MOD CON DCE	Selects the Contradirectional mode with DCE emulation
INT SET 64G703 OCT ON	Enables octet timing
INT SET 64G703 OCT OFF	Disables octet timing
INT SET 64G703 INP BRI	Selects Bridge input impedance, 1000-ohms
INT SET 64G703 INP TER	Selects Term input impedance, 120-ohms
INT SET 64G703 ERR INS OFF	Disables the error insert rate
INT SET 64G703 ERR INS SIN	Selects the single error insert rate
INT SET 64G703 ERR INS 1E-6	Selects the fixed 1E-6 error insert rate
INT SET 64G703 THR ON	Selects the Thru Data mode
INT SET 64G703 THR OFF	Disables the Thru Data mode

The INT SET commands provide full remote control of the CCITT G.703 64 kb/s Data Interface. INT SET displays but does not override the currently active interface in the FIREBERD mainframe. INT SEL SLOT 1 selects the CCITT G.703 64 kb/s Data Interface as the active interface, if it is installed in the bottom (standard) interface slot.

controlled. The Remote Control Commands Handbook describes the mainframe remote control capabilities.

Only the remote control commands specific to this interface are included in Table 3-2. For additional information concerning remote control of the FIREBERD mainframe, refer to the Remote Control Commands Handbook.

INTERFACE SPECIFICATIONS

4.1 INTRODUCTION

This section contain the interface specifications for the CCITT G.703 64 kb/s Data Interface. This information is listed in Table 4-1.

Table 4-1
CCITT G.703 64 kb/s Data Interface Specifications

Item	Specification
General	
Operating Rate:	64 kb/s typical, ±5 ppm (crystal oscillator). 64 kb/s typical, ± 100 ppm (FIREBERD BNC).
Coding:	AMI (Alternate Mark Inversion).
Connectors:	4 mm banana jacks.
	Codirectional Interface
Bit Rate:	256k baud (64 kb/s).
Block Code Format:	A binary 1 is coded as a 1100 block. A binary 0 is coded as a 1010 block.
Pulse Shape:	Conforms to the masks recommended in CCITT Recommendation G.703.
Typical Peak Voltage:	Marks: 1.0V ±0.1V. Spaces: 0V ±0.1V.
Typical Pulse Width:	Single pulse: 3.9 microseconds. Double pulse: 7.8 microseconds.
Input Impedance:	Term: 120 ohms, resistive. Bridge: 1000 ohms, resistive.
Input Signal Level:	250mV to 3V.
Octet Code Format:	Alternate block inversion with bipolar violations for octet timing.
Pair for Each Direction:	1 Symmetric balanced pair.
Ratio of the Amplitudes of Positive-to-Negative Pulses at the Center of the Pulse Interval:	0.95 to 1.05.
Ratio of the Widths of Positive-to-Negative Pulses at Half-Amplitude	0.95 to 1.05.

Table 4-1
CCITT G.703 64 kb/s Data Interface Specifications (Continued)

Item	Specification
Centralized Clock and Contradirectional Interfaces	
Bit Rate:	64 kb/s.
Pulse Shape:	Conforms to the masks recommended in CCITT Recommendation G.703
Typical Peak Voltage:	Marks: 1.0V ±0.1V. Spaces: 0V ±0.1V.
Typical Pulse Width:	Data: 15.6 microseconds. Clock: 7.8 microseconds.
Input Signal Level:	250mV to 3V.
Code Format:	Data: AMI with 100% duty cycle. Clock: AMI with 50% duty cycle and bipolar violations for octet timin
Pair for Each Direction:	1 Symmetrical balanced pair for data signal. 1 Symmetrical balanced pair for the composite timing signal.
Ratio of the Amplitudes of Positive-to-Negative Pulses at the Center of the Pulse Interval:	0.95 to 1.05.
Ratio of the Widths of Positive-to-Negative Pulses at Half-Amplitude:	0.95 to 1.05.

MAINTENANCE AND SERVICE

5.1 INTRODUCTION

This section contains information on maintenance and service for the CCITT G.703 64 kb/s Data Interface, including TTC's warranty policies and repair procedures.

5.2 MAINTENANCE

5.2.1 In Case of Difficulty

If the unit totally fails to operate after installing the interface in the FIREBERD mainframe, (i.e., no panel indicators light), check the following items:

- Verify that the supply line voltage is present.
- Verify that the AC line cord is supplying the line voltage to the mainframe.
- On the FIREBERD mainframe, verify the proper line voltage selection.
- On the FIREBERD mainframe, verify the fuse is not blown and that it is correct for the supplied line voltage.
- Verify the interface is properly seated into the mainframe.

If some of the indicators light but the unit fails to operate, verify that the interface installed is the correct type and that it is properly installed. Be sure to turn the power off before trying to remove or reseat the interface. If another interface module is available, turn off the power and substitute the other interface.

If troubles still persist, follow the self-test procedures in the FIREBERD Operating Manual as an aid in localizing the problem. If the mainframe continues to be inoperative, refer to the following sections for service information, or call the TTC Customer Service Department for assistance.

5.3 SERVICE

5.3.1 Warranty Policy

All equipment manufactured by Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

Data interfaces, accessories, cables, breakout boxes, and all equipment (other than FIREBERD mainframes) will be repaired or replaced (at our option), at no charge, for a period of one (1) year after shipment to the customer.

Liability under this warranty extends only to the replacement value of the equipment. This warranty is void if:

(1) Equipment has been altered or repaired without specific written authorization from TTC.

(2) Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

5.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with the instructions in Section 5.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Repair Department. The RA number should be included on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid.

A brief description of the work performed and the materials used will be provided on the Equipment Repair Report that will be furnished with the returned equipment.

5.3.3 Out-of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department for specific information on the minimum out-of-warranty repair charge.

The customer will be billed for parts and standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started. A hard copy of the purchase order must be received by TTC before the repaired equipment can be shipped to the customer. A description of the materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

5.3.4 Equipment Return Instructions

To all equipment returned for repair the customer should attach a tag that includes the following information.

(1) Owner's name and address.

(2) A list of equipment being returned and the corresponding serial number(s).

(3) A detailed description of the problem or of the service requested.

(4) The name and telephone number of the person to contact regarding questions concerning the repair(s).

(5) The Return Authorization (RA) number.

If possible, the customer should return the equipme
the original shipping container and material. If the ori
container is not available, the unit should be carefully p
aged so that it will not be damaged in transit. TTC is not l
for any damage that occurs during shipment. The cust
should clearly mark the TTC-issued RA number or
outside of the package and ship it prepaid and insured to

APPENDIX A

Table A-1
Revision F Remote Control Commands

The FIREBERD 6000 remote control commands supported by Revision F software or lower are as follows:

Remote Command	Result
INT SET	Displays the active interface
INT SET 64G703	Selects the CCITT G.703 64 kb/s Data Interface as the active interface
INT SET 64G703 MOD COD	Selects the Codirectional mode
INT SET 64G703 MOD CEN	Selects the Centralized Clock mode
INT SET 64G703 MOD CON DTE	Selects the Contradirectional mode with DTE emulation
INT SET 64G703 MOD CON DCE	Selects the Contradirectional mode with DCE emulation
INT SET 64G703 OCT ON	Enables octet timing
INT SET 64G703 OCT OFF	Disables octet timing
INT SET 64G703 INP BRI	Selects Bridge input impedance, 1000-ohms
INT SET 64G703 INP TER	Selects Term input impedance, 120-ohms
INT SET 64G703 ERR INS OFF	Disables the error insert rate
INT SET 64G703 ERR INS SIN	Selects the single error insert rate
INT SET 64G703 ERR INS RAT xE-y	Sets the operator specified error insert rate where: x = 1-9 y = 3-9
INT SET 64G703 THR ON	Selects the Thru Data mode
INT SET 64G703 THR OFF	Disables the Thru Data mode

The INT SET commands provide full remote control of the CCITT G.703 64 kb/s Data Interface. INT SET displays but does not override the currently active interface in the FIREBERD mainframe. INT SET 64G703 selects the CCITT G.703 64 kb/s Data Interface as the active interface.

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